CLAIMS

What is claimed is:

1. A method for producing nano-size powders of metal fluoride comprising:

mixing a continuous phase comprising at least one metal cation salt with a hydropolymeric or organic polymeric disperse phase;

forming a metal cation salt/polymer gel and exposing the gel to anhydrous hydrofluoric acid to convert the metal cation salt to a metal cation fluoride salt;

heat-treating such gel, after having been exposed to the anhydrous hydrofluoric acid, at temperatures sufficient to drive off water and organics within such gel; and

leaving as a residue a nano-size powder of metal fluoride.

2. The method of claim 1 wherein said hydrophilic organic polymeric disperse phase comprises an organic material from the group consisting of carbohydrates, derivatives, polymers, and proteins derived from animal protein-gelatins.

3. The method of claim l wherein said gel is heat-treated to a temperature in the range of 22°C to 240°C.

4. The method of claim 1 wherein at least one metal cation salt is selected from the group consisting of: chlorides, carbonates, isopropoxides, nitrates, acetates, epoxides, and oxalates.

5. The method of claim 1 wherein said metal cations are selected from the group consisting of at least one metal of Group 1A, 2A, 3A, 4A, 5A, 6A, 1B, 213, 3B, 4B, 513, 6B, 713, and 8 of the Periodic Table.

6. The method of claim 2 wherein said hydrophilic polymers are selected from the group consisting of hydrophilic homopolymers and copolymers of ethylene oxide, 2-hydroethylenemathacrylate, hydroxyalkylmathacrylates, hydroxyalkylacrylates, acrylamide and n-vinylpyrrolidone.

7. A method for producing a catalyst comprising:

dissolving anhydrous ferric trichloride in a solvent to create a ferric trichloride/solvent solution;

blending the ferric trichloride/solvent solution with a polymer to create a mixture;

adding the mixture to anhydrous hydrofluoric acid thereby converting the ferric trichloride to ferric trifluoride;

separating the ferric trifluoride; and

drying the ferric trifluoride.

8. The method of claim 7 wherein the anhydrous ferric trichloride is essentially chemically pure.

9. The method of claim 7 wherein the solvents comprise one or more of alcohol, methanol, ether, benzene, and acetone.

10. The method of claim 7 wherein a sufficient quantity of ferric trichloride is dissolved to essentially saturate the solvent with the ferric trichloride.

11. The method of claim 7 wherein the polymer is polyethylene glycol.

12. The method of claim 7 further comprising:

mixing the ferric trichloride/solvent solution and the polymer until the combined ingredients is clear, uniform and stable.

13. The method of claim 7 wherein the adding step further comprises stirring.

14. The method of claim 7 wherein the adding step further comprises:

adding the mixture to anhydrous hydrofluoric acid until the stoichiometric ratio of the gram moles of the ferric trichloride within the mixture is between one half and one sixtieth of the relevant gram moles of anhydrous hydrofluoric acid.

15. The method of claim 7 wherein the ferric trifluoride is dried slowly in stages, up to 100°C, until any moisture has been driven off and thereafter the temperature is raised to 240°C.

16. The method of claim 15 wherein any remaining solvent and polymer evaporates at high temperature thereby freeing the ferric trifluoride of the solvent and/or the polymer.

17. The method of claim 7 further comprising:

placing dried ferric trifluoride in containers that prevent the ferric trifluoride from becoming hydrated.

18. The method of claim 7 wherein a resultant anhydrous ferric trifluoride product is essentially chemically pure and exhibits discrete, nonagglomerated, uniform particles with a mean particle size in the order of 0.2 micron and a surface area in the order of 150 square meters per gram.

19. The method of claim 7 wherein a resultant ferric trifluoride product exhibits a pH of between 4.0 and 7.0 when one gram of the ferric trifluoride is mixed with 10 grams of demineralized water.

20. A method for producing a catalyst comprising:

dissolving ferric trichloride in distilled warm water to form a salt solution;

combining the salt solution with polyethylene glycol powder to form a mixture;

stirring the mixture until the mixture is a clear solution;

adding the mixture to anhydrous hydrofluoric acid, thereby allowing the ferric trichloride to react with the anhydrous hydrofluoric acid and to convert to ferric trifluoride;

separating the ferric trifluoride; and

drying the separated ferric trifluoride.

21. The method of claim 20 wherein the mixture is added to the anhydrous hydrofluoric acid drop by drop until the stoichiometric ratio of the gram moles of ferric trichloride within the mixture is equal to or less than one half the relevant gram moles of anhydrous hydrofluoric acid.

22. The method of claim 20 wherein the adding step is accompanied by stirring.

23. The method of claim 20 wherein the separated ferric trifluoride material is dried slowly in stages, up to 100°C, until all volatile materials have been driven off, and wherein a temperature of the ferric trichloride is raised to the point where remaining solvents and polymers evaporate and/or decompose so that the ferric trifluoride becomes completely free from all of the solvent and/or the polymer.

24. The method of claim 20 further comprising:

placing dried ferric trichloride in containers to keep the ferric trifluoride from becoming hydrated.